f

is also introduced as before, through the fireboxer, It follows that when the damper or stopper at the top of the chimney is opened slightly, the model will represent a downdraft brick kiln in operation.

It is seen that in the downdraft kiln the hottest gases rise to the highest point under the roof, where they accumulate, forcing the cold gases to the chimney through the ports in the hearth of the kiln. Descending little by little toward the sole of the kiln, the flames or hot gases finally fill the entire kiln chamber and maintain themselves throughout it, only passing to the chimney as they are displaced by hotter gases. In this manner the free lower surface of the hot layer of gases is very nearly stationary, which insures a practically uniform burn to the brick. In this atmosphere, which varies very little, the reactions of combustion are readily effected until only very slight traces of the combustible elements and free oxygen can be found in the gases. That is, combustion takes place with very nearly the theoretical supply of oxygen. The flames of this combustion traverse the entire mass of the gases and there are no definite points at which high temperatures may be found. For this reason the downdraft kiln is successfully employed when it is desired to obtain slow and uniform heating.

These experiments with a model of a furnace immersed in water confirm, with sufficient clearness, the fundamental principle that the circulation of the hot gases within a furnace is similar to the circulation of a light liquid within an enclosure filled with a heavy liquid.

III. THE CURRENT OF THE HOT GASES MAY BE COMPARED TO

A STREAM OF WATER TURNED UPSIDE DOWN OR INVERTED

Streams composed of a heavy fluid in motion within a lighter fluid are seen everywhere. Do not all rivers represent the displacement of a light fluid—the air—by a heavy fluid—the water?

In this case, it is very well known that the stream is confined on the bottom and the sides.

If the flame and the hot gases within the furnace were fluids heavier than the air, it would be found that they flowed in the same manner as the stream of water. But as they are much lighter